Ontario

ORDER NO. 88-061
FEBRUARY 1988
AGDEX 460
10

Factsheet

HORSE MANAGEMENT

ANATOMY AND PHYSIOLOGY OF REPRODUCTION IN THE STALLION

This material was originally prepared by Les Burwash, Horse Industry Branch, Alberta Agriculture and has been adapted for use by the Ontario Ministry of Agriculture and Food, Animal Industry Branch into factsheet format by Dr. R. G. Wright, Co-ordinator for Equine Program.

Horses have the potential for high reproductive performance, yet many horsemen do not understand the basics well enough to exploit this potential.

The objective of this factsheet, which is one of the Horse Management series under Agdex Number 460–10, is to present information on reproduction and management that will assist in obtaining maximum reproductive performance in the stallion.

Functions of the Male Reproductive System

1. Production of male reproductive cells — sperm (spermatozoa).
2. Production of the male sex hormone — testosterone.
3. Place sperm cells in the female reproductive system.

Hormones of Male Reproduction

The main hormone is testosterone. Testosterone promotes the development and function of the accessory sex glands, causes development of secondary sex characteristics, and is necessary for mating activity, including sex drive, erection of the penis, and ejaculation.

Testosterone also promotes body growth.

Sperm production is initiated by a hormone FSH (follicle stimulating hormone) from the pituitary gland, but LH (luteinizing hormone) and testosterone are necessary for completing the process.

ANATOMY OF THE REPRODUCTIVE TRACT OF THE STALLION

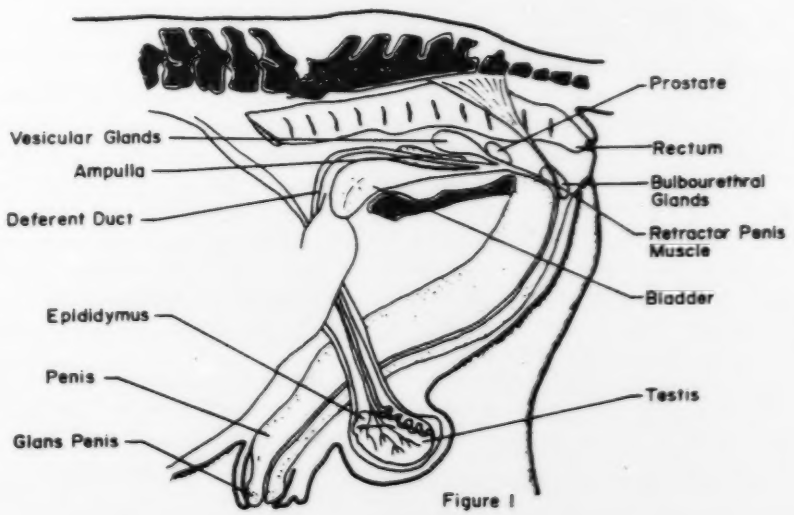

Figure 1

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Testes or Testicles

The two testes are enclosed in the scrotum. The main functions of the scrotum are to protect the testes and to maintain the testes at a temperature several degrees lower than body temperature.

The testes produce sperm cells and the male sex hormone testosterone. The sperm cells are too small to be seen with the naked eye, but when viewed under a high power microscope, each has a head and a tail similar to a tadpole. It would take about 5,000 sperm lying side by side to equal one inch.

- **Epididymis** – The epididymis transports sperm from the testes to the deferent duct, and is the area for concentration, maturation and storage of the sperm.
- **Deferent Duct** – The deferent ducts transport sperm from the epididymis to the area of the accessory sex glands.
- **Vesicular Glands** – The vesicular glands are accessory sex glands and add the gel fraction to the ejaculate.
- **Bulbourethral, Vesicular and Prostate Glands** – These are accessory sex glands which add fluids to the ejaculate.

Penis

The penis provides the means of passage of urine out of the body and penetration of the female reproductive system for semen deposition. The penis is composed primarily of erectile tissue. Upon erection, the penis may increase 50 percent or more in diameter and length. The urethra is the tube which runs the length of the penis, conducting the urine and semen to the outside.

- **Glans Penis** – This is the sensitive end of the penis that enlarges during excitation and copulation.
- **Retractor Penis Muscle** – This muscle retains the placid penis in the sheath and relaxes during erection.

SEASONAL INFLUENCE ON STALLIONS

As in the mare, reproductive performance of the stallion is affected by the season of the year. In a study conducted at Colorado State University, five mature stallions were put on a collection schedule that spanned 13 months. Two ejaculates were collected weekly approximately one hour apart. Greater seminal volume is produced in the spring and summer than in winter. The average volume of seminal plasma is approximately 65 mL but may vary from 5 to 100 mL. Sexual stimulation will increase seminal plasma volume but not sperm output. Of more importance to the stallion owner is sperm production. During the winter months sperm production is approximately one-half that of spring and summer. Thus, in theory, one could breed one-half as many mares in January as in June. Sperm motility is not influenced by the seasons.

The Colorado researchers have also studied sperm production and output. Sperm production is related to testicular size in that one gram of testicular tissue produces approximately 16 million (16×10^6) sperm cells per day during the breeding season. During the summer months the average mature stallion will produce approximately 8 billion sperm cells per day. The normal stallion has extra gonadal sperm reserves of approximately eight days production.

Total scrotal width will vary with season, showing a 17 percent decrease from July to November. This accounts for part of the seasonal influence on sperm output.

The age of the stallion affects the size and integrity of the testicular tissue, which influences sperm output. Total scrotal width increases until the stallion is at least six years of age. This will remain relatively constant until testicular degeneration takes place with age. The time frame regarding this varies with the individual stallion. Spermatozoal storage capacity is considerably larger in the mature stallion than in the two or three year old. As a general rule, the mature stallion produces in excess of twice the number of spermatozoa per day as a two or three year old stallion. Thus, the two and three year old stallion cannot be used as frequently as the mature stallion without reducing fertility. Age does not influence semen quality in normal stallions.

The number of times a stallion can be used in a given period of time is influenced by (a) sperm output, (b) age, (c) semen quality, and (d) desire to breed. Recent studies by the Colorado workers and workers at the University of Saskatchewan, Saskatoon indicate that desire to breed may be the limiting factor in mature normal stallions. Using normal stallions to breed mares two or three times per day is not excessive.

The seasonal influence that most stallion owners see is a difference in sexual response. Figure 2 shows the reaction time of stallions as influenced by season. During the breeding season (April, May, June, July and August) it took less than two minutes for the stallions to become sexually stimulated, mount and enter the artificial vagina. In the wintertime the reaction time was in excess of 10 minutes. This also plays a role when training the young stallion to breed, therefore it is most desirable to commence in the normal breeding season.

The seasonal influence on ability to ejaculate is shown in Figure 3 in the normal breeding season just over one mount per ejaculate was required but in the non-breeding season there were in excess of 2.5 mounts per ejaculate required. In handling stallions, just because the stallion mounts and copulates, it does not mean that he ejaculates.

STALLION INFERTILITY

Hemospermia

Hemospermia means blood in the semen, which renders the spermatozoa infertile. Call your veterinarian if you see indications of blood on the front of the back legs, dripping from the penis or in the semen.

Figure 2

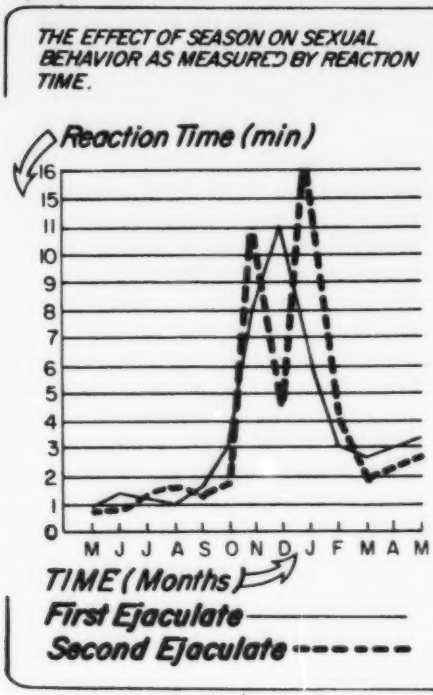
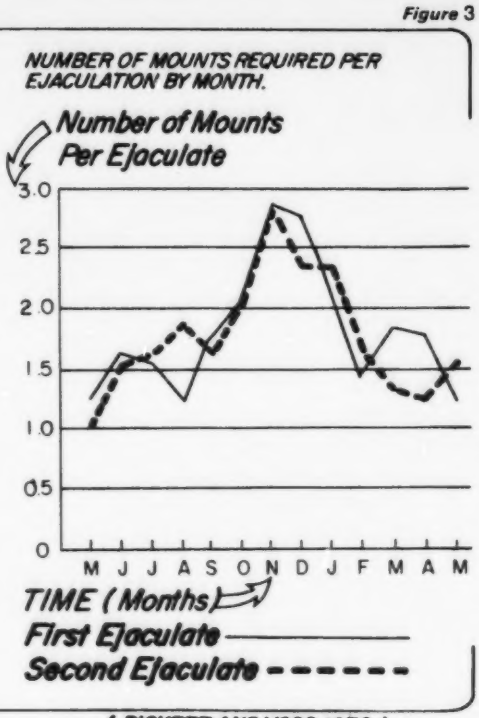


Figure 3



(PICKETT AND VOSS 1972)

Diseases

Klebsiella and B-hemolytic streptococci are organisms associated with infertility. Infected stallions tend to shed these organisms intermittently and mares tend not to conceive while the organisms are being shed. Apparently they are harboured in the prepuce area. Positive diagnosis can be determined from a semen culture and/or a urethral and prepuce swab following ejaculation. Although the infected stallion may spontaneously rid himself of the organisms, to date treatment of infected stallions consists of treating semen with antibiotics and cleansing the prepuce and irrigating the area and the urethra with glycerine and the appropriate antibiotic. The use of artificial insemination is the only way in which effective treatment of semen with antibiotics is possible.

Overuse

Stallions can be temporarily infertile or subfertile when subjected to overuse. Use depends on the individual stallion's sperm production, viability, and desire to breed. Some stallions can be used two to three times a day with no apparent problems, where once a day is too heavy for others. It is best to have a potential fertility examination done on all stallions prior to the breeding season to determine individual schedules of use and number of mares to book to each stallion. The limiting factor as to number of mares a normal mature stallion can breed is libido or desire to breed.

Cryptorchidism

Sometimes one and rarely both testicles fail to descend from the abdominal cavity into the scrotum. This is known as cryptorchidism (or a cryptorchid). The testicles of the male fetus are located in the abdomen, in a position similar to the ovaries of the female. It is the job of the gubernaculum, a ligament attached to the testicle at one end and the bottom of the scrotum at the other end, to contract, pulling the testicle through the inguinal canal into the scrotum. This process normally occurs at, or shortly before birth. A unilateral cryptorchid can be fertile but should be castrated, since the condition is inherited.

Illness

If a stallion becomes ill or an injury occurs causing testicular temperature to become elevated, damage to stored spermatozoa begins. As the time and temperature increase, recovery is prolonged. It has been shown that it takes approximately 60 days for a sperm cell to be produced and ejaculated. If a stallion has been ill for a prolonged period of time with sufficient temperature elevation in the testes, the stallion could be infertile for 60 days after the testes temperature has returned to normal.

Not Ejaculating

Sometimes a stallion will mount and go through all the motions of breeding yet not ejaculate. This may be due to overuse, a bad experience (kicked, mishandled while copulating) or the time of year. The stallion manager should be experienced and capable of knowing if ejaculation has taken place. Some indications of ejaculation include flagging of the tail and a cessation of aggressiveness. Also, pulsations can be felt on the base of the stallion's penis. If a stallion is a gel producer there may be gel adhering to the end of the penis after

dismounting. If a stallion has not ejaculated he will probably maintain interest in the mare after dismounting.

STALLION MANAGEMENT

Stallions are like any other class of livestock where the male can be managed effectively or ineffectively. Stallions require a balanced ration and free access to clean fresh water. It is best to have the stallion enter the breeding season in excellent condition, as some stallions will lose some weight and condition. Stallions may be maintained individually in open front sheds with 15 x 6 metre runs in front. Most stallions exercise themselves thus reducing labor.

Stallions should be trained to handle the breeding process mannerly. The stallion should approach the mare slightly to the left and from the rear, obtain an erection but not mount until the stallion handler allows him to. Once the stallion has mounted, he should be taught to remain mounted until he ejaculates and loses his erection. If stallions are handled in a routine manner each breeding, and the handler maintains discipline, there will be few problems.

Individual stallions may vary, but most mature stallions can be used twice a day. It is advisable to use the stallion early in the morning and late in the evening when using him twice in one day. The stallion should be rested when ever possible to reduce the possibility of overuse.

BREEDING AGES

Horses reach puberty between 12 to 18 months of age. It is therefore advisable to keep the stallions and fillies separate once they have reached a year of age. Even though young horses can reproduce, it is not advisable to have them do so. Mares should be handled and performance tested prior to going into the broodmare band. This gives the owner an opportunity to assess if the mare is worth breeding and also increases the value of her foals if she performs well. Mares that are bred to foal prior to maturity will require extra care and nutrition, especially during the period of lactation and last three months of pregnancy, so that she and her foal will grow to their genetic potential.

A stallion should be test mated when he is two or three years of age, then put into training and performance tested for a couple of years. This gives the owner the opportunity to evaluate his performance potential. In addition, a genetic proof can be produced from a minimum of 10 offspring from these test matings. Also, it allows for the test bred mares' foals to be born and give the owner an opportunity to evaluate the stallion's potential as a sire. Just because a mare or stallion can reproduce does not mean they should be allowed to. Think of advancement of the breed and not merely of obtaining a foal.

ISSN 0225-7882

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